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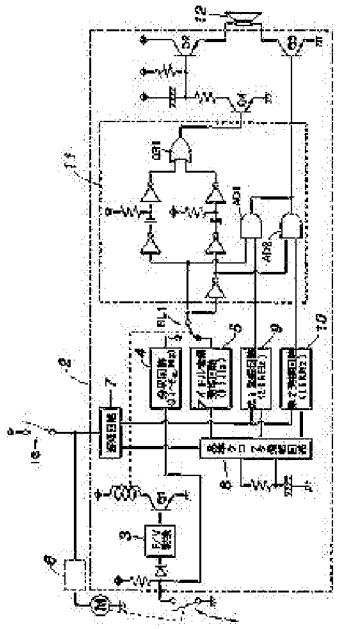
(54)【考案の名称】　疑似エンジン音発生装置

(57)【要約】

【目的】　電気自動車の種々の運転状態に応じた好適な疑似エンジン音を発生する。

【構成】　駆動用モータを回転可能にするためのイグニッションスイッチ１Ｇの信号と、車速センサ１からの車速パルス信号とを制御回路２に入力し、イグニッションスイッチ１Ｇのオン状態で、車両の停止状態（車速パルスの入力が無し）の時には０．５Ｈｚの電子チャイム音をスピーカ１０から発生し、走行状態（車速パルスの入力が有り）の時には車速パルスの周波数に応じて０．５～F_{max}Ｈｚ（任意の最大周波数）の電子チャイム音をスピーカ１０から発生する。

【効果】　アイドリング状態や走行時のエンジン回転数の大きさに応じた疑似エンジン音にて車両の状態を、運転者や歩行者に好適に知らせることができる。



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【実用新案登録請求の範囲】

【請求項１】　電気自動車の駆動用モータを回転可能にするための準備スイッチと、車速を検出するための車速検出手段と、発音体と、前記発音体から疑似エンジン音を発生させるための発音体駆動制御手段とを有する疑似エンジン音発生装置であって、

前記発音体駆動制御手段が、前記準備スイッチにより前記モータの回転可能状態を検出した場合に於いて、前記車速検出手段により前記電気自動車の停止状態を検出した場合には前記発音体から比較的小さい音圧または低い周波数の音を発生させ、前記車速検出手段により前記電気自動車の走行状態を検出した場合には車速の上昇に伴って前記音圧を増大しまたは前記周波数を高めるように制御することを特徴とする疑似エンジン音発生装置。

【図面の簡単な説明】

【図１】本考案が適用された電気自動車の疑似エンジン＊

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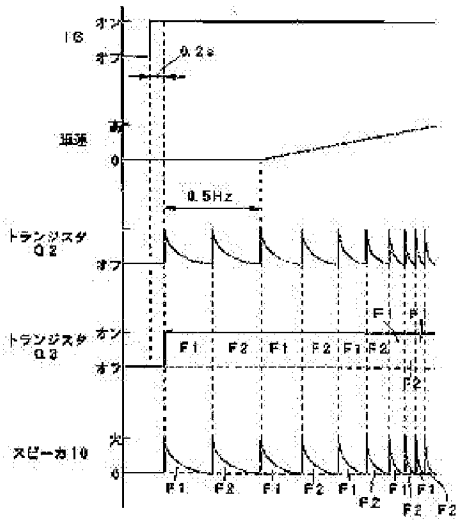
＊音発生回路全体を示す図。

【図２】疑似エンジン音の発生要領を示すタイムチャート。

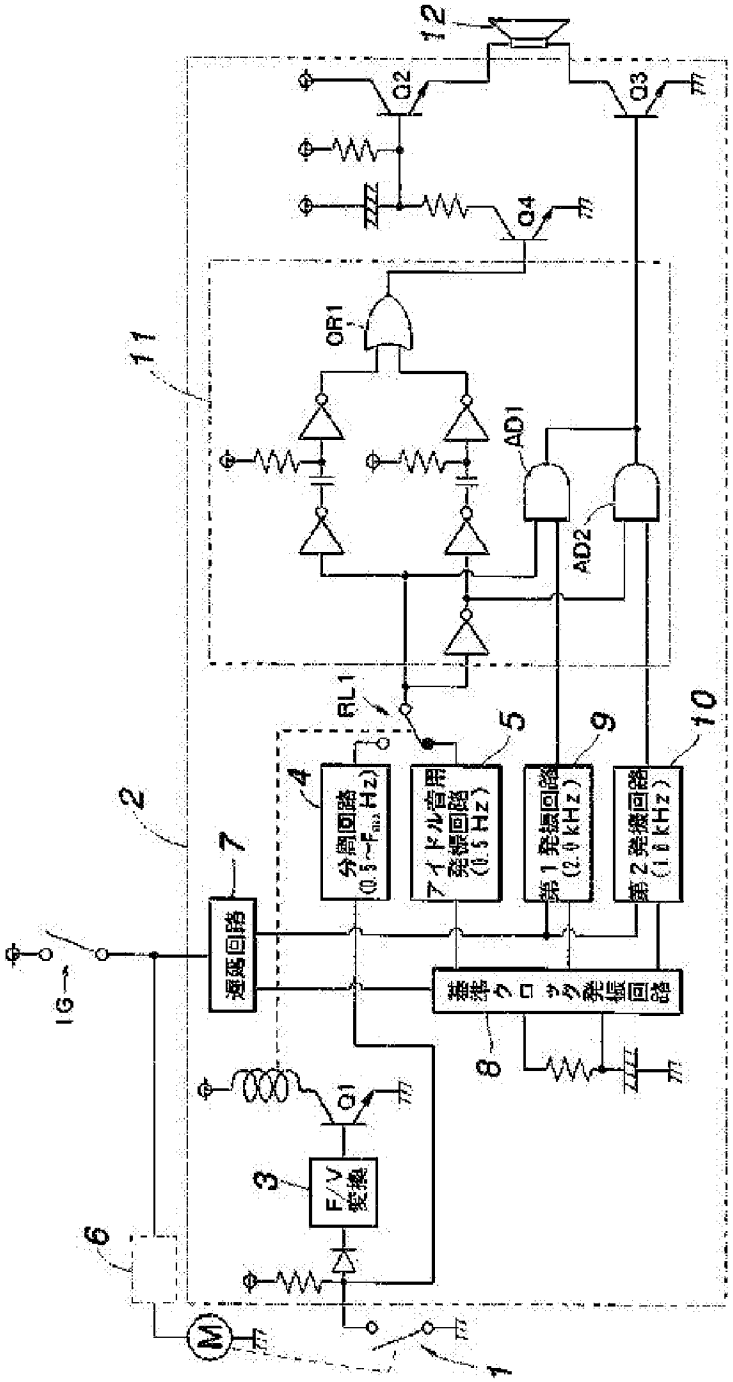
【符号の説明】

１　車速センサ
２　制御回路
３　Ｆ／Ｖ変換器
４　分周回路
５　アイドル音用発振回路
６　モータ制御回路
７　遅延回路
８　基準クロック発振回路
９　第１発振回路
１０　第２発振回路
１１　チャイム音生成回路
１２　スピーカ

【図２】



【図1】


12
Q2
Q3
Q4
OR1
11
AD1
AD2
RL1
5
9
10
4
分周回路
(0.5~F_{max}Hz)
アイドル音用
発振回路
(0.5Hz)
第1発振回路
(2.0kHz)
第2発振回路
(1.0kHz)
2
7
IG
遅延回路
基準クロック発振回路
8
Q1
3
F/V
変換
6
M
1

【考案の詳細な説明】

【０００１】

【産業上の利用分野】

本考案は、電気自動車に於ける疑似エンジン音を発生するための疑似エンジン音発生装置に関する。

【０００２】

【従来の技術】

動力に電動モータを用いた電気自動車にあっては、内燃機関を用いた自動車に比べて振動が少なく、エンジン音も静かであるという利点がある。また、このような電気自動車にあっては、内燃機関を用いた自動車に於けるスロットル操作と同様のスロットル操作を行って、運転者の意志に基づいた運転を行うようにしたものがある。

【０００３】

上記したように電気自動車にあってはモータ（エンジン）音が静かであることから、走行可能な状態（イグニッションスイッチのオン状態）であるのか、走行時のモータの回転がどのような状態になっているのか等、従来の内燃機関の自動車に於けるエンジン音による判断ができないという問題があった。また、歩行者などに対して注意を促す必要があり、従来の電気自動車に於いて走行中であることを知らせるための音を発するようにしたものがあった。

【０００４】

上記の音を発するようにしたものとしては、イグニッションのオン状態と同様の状態で、ある程度の音圧（周波数）レベルの音を発生させ、走行可能な状態であることを認識させるようにしたものがある。しかしながら、従来の電気自動車では、停止時や走行時でも一定の音圧（周波数）の音を発生させるものであり、停止や車速の高低状態を含めた走行状態に対して不自然であるという問題があった。

【０００５】

【考案が解決しようとする課題】

このような従来技術の問題点に鑑み、本考案の主な目的は、電気自動車の種々

の運転状態に応じた好適な疑似エンジン音を発生し得る疑似エンジン音発生装置を提供することにある。

【０００６】

【課題を解決するための手段】

このような目的は、本考案によれば、電気自動車の駆動用モータを回転可能にするための準備スイッチと、車速を検出するための車速検出手段と、発音体と、前記発音体から疑似エンジン音を発生させるための発音体駆動制御手段とを有する疑似エンジン音発生装置であって、前記発音体駆動制御手段が、前記準備スイッチにより前記モータの回転可能状態を検出した場合に於いて、前記車速検出手段により前記電気自動車の停止状態を検出した場合には前記発音体から比較的小さい音圧または低い周波数の音を発生させ、前記車速検出手段により前記電気自動車の走行状態を検出した場合には車速の上昇に伴って前記音圧を増大しまたは前記周波数を高めるように制御することを特徴とする疑似エンジン音発生装置を提供することにより達成される。

【０００７】

【作用】

このようにすれば、従来の内燃機関エンジン車のアイドリング状態に相当する状態を、モータの回転可能な状態であってかつ車両の停止状態であるという検出により判別でき、そのアイドリング状態では比較的小さい音圧または低い周波数の疑似音を発生し、車速に応じて音圧または周波数を変化させた音を発生することにより、従来の自動車のエンジン音と同様に、運転状態に応じて変化する音を発生することができる。

【０００８】

【実施例】

以下、本考案の好適実施例を添付の図面を参照して詳しく説明する。

【０００９】

図１は、本考案が適用された電気自動車（例えば電動２輪車）の疑似エンジン音を発生するための回路全体を示す図である。図１に於いて、例えば駆動用モータＭの回転数に応じて周波数が変化するパルスを発することにより車速を検出し

得る車速センサ１から発せられる車速パルス信号が、発音体駆動制御手段としての制御回路２内で分岐され、一方がＦ／Ｖ変換器３に入力し、他方が分周回路４に入力するようになっている。このＦ／Ｖ変換器３は、本実施例では車速パルス信号の発生を検出したらトランジスタオン信号を出力し、そのトランジスタオン信号によりリレー駆動用トランジスタＱ１をオンするようになっている。

【００１０】

上記分周回路４は、車速パルス信号が発生したら例えば０．５Hzの信号を出力し、車速パルス信号の増減に応じて０．５Hz～F_{max}（任意の最大周波数）の周波数を増減させることができるものである。分周回路４の上記出力信号は、前記リレー駆動用トランジスタＱ１により駆動されるリレーＲＬ１の２位置選択式接点の常時開側に出力されるようになっている。そのリレーＲＬ１の２位置選択式接点の常時閉側には、分周回路４と並列に設けられたアイドル音用発振回路５からの例えば０．５Hzの発振信号が出力されるようになっている。

【００１１】

上記モータＭをモータ制御回路６を介して制御可能にする準備スイッチとしてのイグニッションスイッチＩＧからのオン／オフ信号が、本制御回路２内の遅延回路７に入力し、その遅延回路７の出力信号が、基準クロック発振回路８と第１及び第２発振回路９・１０に入力するようになっている。基準クロック発振回路８の出力信号はアイドル音用発振回路５と第１及び第２発振回路９・１０に入力するようになっている。第１発振回路９は例えば２．０kHz（Ｆ１）の信号を出力し、第２発振回路１０は例えば１．６kHz（Ｆ２）の信号を出力するものである。そして、分周回路４とアイドル音用発振回路５とからリレーＲＹ１の切換接点を介して出力される信号と、前記第１及び第２発振回路９・１０から出力される各信号とが、チャイム音生成回路１１に入力するようになっている。

【００１２】

また、発音体としてのスピーカ１２は、電源側のトランジスタＱ２と接地側のトランジスタＱ３とが共にオン状態になったら発音するように接続されている。上記トランジスタＱ２は、前記チャイム音生成回路１１の出力段のオア回路ＯＲ１の出力信号によりオン状態になるトランジスタＱ４がオンした時にオンし、ト

ランジスタＱ３は、チャイム音生成回路１１の出力段の互いに並列な両アンド回路ＡＤ１・ＡＤ２の出力信号によりオンするようになっている。

【００１３】

上記オア回路ＯＲ１の入力段には、前記分周回路４またはアイドル音用発振回路５の出力信号の立ち上がり・立ち下がりのタイミング毎に、立ち上がりその後漸減する波形の信号を形成するＣＲ時定数回路が設けられている。従って、トランジスタＱ２の出力は、図２に示されるように連続的に、立ち上がった後漸減する波形となる。

【００１４】

また、分周回路４またはアイドル音用発振回路５の出力信号は、上記両アンド回路ＡＤ１・ＡＤ２にも入力しており、上記立ち上がり・立ち下がりのタイミングで２．０kHzの信号と１．６kHzの信号とがトランジスタＱ３に出力されることになる。従って、トランジスタＱ３の出力には、図２に示されるように２．０kHzの信号と１．６kHzの信号とが交互に生じる。

【００１５】

このようにして構成された疑似エンジン音発生回路の信号発音要領を以下に示す。まず、内燃機関エンジン車のエンジンスタートと同様にイグニッションスイッチＩＧをオンにすると、遅延回路７を介することにより０．２ｓ後に、アイドル音用発振回路５からの０．５Hz信号が出力されると共に、第１及び第２発振回路９・１０からそれぞれの周波数Ｆ１・Ｆ２の信号が出力される。なお、発進前の停止状態（内燃機関エンジン車のアイドリング状態に相当する）では、車速センサ１から車速パルス信号が発生されていないことからリレーＲＬ１が非励磁状態であるため、アイドル音用発振回路５からの０．５Hz信号がチャイム音生成回路１１に入力する。従って、この０．５Hz信号のタイミングにて、疑似エンジン音として２．０kHzの信号と１．６kHzの信号とが切替わる（図２参照）電子チャイム音がスピーカ１２から発音されるため、運転者及び歩行者などは、車両がアイドル状態であることを認識することができる。

【００１６】

次に、スロットルを操作して車両を発進させて車速パルスが生じると、トラン

ジスタＱ１がオンし、リレーＬＲ１が切替わるため、分周回路４の信号がチャイム音生成回路１１に入力するようになる。そして、車速の上昇に伴って、分周回路４の信号の周波数が高まり、図２に示されるようにトランジスタＱ２・Ｑ３の周期が０．５Hzより短くなっていくため、２．０kHz（Ｆ１）の信号と１．６kHz（Ｆ２）の信号との切替わりが車速に応じて早まる。従って、車速に応じて変化する周期にて２．０kHzの信号と１．６kHzの信号とが切替わるチャイム音が発生するため、運転者は、車速に応じて変化するチャイム音を認識しつつ運転することができる。また、歩行者なども、近づいてくる車両の速度を音によりある程度判別可能である。

【００１７】

なお、本実施例ではチャイム音を、その周波数を変化させるようにしたが、周波数変化に限るものではなく、例えば音圧を変化させるようにしても良い。

【００１８】

また、本考案に係る疑似エンジン音発生装置としては、本実施例に限定されず、例えば、イグニッションスイッチＩＧのオン状態で比較的小さい音を発するスピーカやホーンなどの発音体をイグニッションスイッチＩＧに接続すると共に、車速に連動して周期の変化する音を発生させるべく、モータまたは車軸に回転体を連結して回転体の回転に伴って発音体をたたく機構にしても良い。また、マイクロコンピュータなどを用いて、車速入力信号に応じて発音体の発する音の周期や音圧を変化させるようにプログラムを作成して、制御するようにしても良い。

【００１９】

【考案の効果】

このように本考案によれば、電気自動車に於いて、内燃機関エンジン車のアイドリング時に相当する疑似音や、車速の高低に応じて変化する疑似音を発生させることにより、内燃機関エンジン車のエンジン音に相当する音の変化を得ることができ、内燃機関エンジン車から電気自動車に乗り換えても、何等不都合を生じることなく運転を行うことができると共に、歩行者などに対しても車両の状態を的確に知らせることができる。

* NOTICES *

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3.In the drawings, any words are not translated.

CLAIMS

[Utility model registration claim]
[Claim 1] The preparation switch for making the motor for actuation of an electric vehicle pivotable, It is the false engine sound generator which has the vehicle speed detection means for detecting the vehicle speed, the sounding body, and a sounding-body actuation control means for generating a false engine sound from said sounding body. [when said sounding-body actuation control means detects the pivotable condition of said motor with said preparation switch] When said vehicle speed detection means detects the idle state of said electric vehicle, the sound of comparatively small sound pressure or a low frequency is generated from said sounding body. The false engine sound generator characterized by controlling to increase said sound pressure with lifting of the vehicle speed, or to raise said frequency when said vehicle speed detection means detects the run state of said electric vehicle.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed explanation of a design]
[0001]
[Industrial Application]
This design is related with the false engine sound generator for generating the false engine sound in an electric vehicle.
[0002]
[Description of the Prior Art]
If it is in the electric vehicle which used the electric motor for power, there are few oscillations compared with the automobile using an internal combustion engine, and there is an advantage that an engine sound is also quiet. Moreover, if it is in such an electric vehicle, there are some which perform throttle actuation in the automobile using an internal combustion engine and same throttle actuation, and were made to perform operation based on an operator's volition.
[0003]
If it was in the electric vehicle as described above, since the motor (engine) sound was quiet, there was a problem that decision by the engine sound in the automobile of that the revolution of the motor at the time of transit is in what kind of condition about whether it is in the condition (ON state of an ignition switch) it can run, etc. and the conventional internal combustion engines could not be performed. Moreover, caution needed to be demanded from the pedestrian etc. and there were some which emitted the sound for telling that it is under transit in the conventional electric vehicle.
[0004]
As what emitted the above-mentioned sound, it is in the ON state of ignition, and the same condition, and the sound of a certain amount of sound pressure (frequency) level is generated, and there is a thing it was made to make it recognize that it is in the condition it can run. However, in the conventional electric vehicle, the sound of fixed sound pressure (frequency) is generated also in the time of a halt and transit, and there was a problem of being unnatural, to a run state including the height condition of a halt or the vehicle speed.
[0005]
[Problem(s) to be Solved by the Device]
Taking an example by the trouble of such a conventional technique, the main objects of this design are to offer the false engine sound generator which may generate the suitable false engine sound according to the various operational status of an electric vehicle.
[0006]
[Means for Solving the Problem]
A preparation switch for such an object to make the motor for actuation of an electric vehicle pivotable according to this design, It is the false engine sound generator which has the vehicle speed detection means for detecting the vehicle speed, the sounding body, and a sounding-body actuation control means for generating a false engine sound from said sounding body. [when said sounding-body actuation control means detects the pivotable condition of said motor with said preparation switch] When said

vehicle speed detection means detects the idle state of said electric vehicle, the sound of comparatively small sound pressure or a low frequency is generated from said sounding body. When said vehicle speed detection means detects the run state of said electric vehicle, it is attained by offering the false engine sound generator characterized by controlling to increase said sound pressure with lifting of the vehicle speed, or to raise said frequency.

[0007]

[Function]

The sound which changes according to operational status as well as the engine sound of the conventional automobile can generate by being able to distinguish the condition are equivalent to the idling condition of the conventional internal-combustion engine vehicle, by detection that are in the pivotable condition of a motor and it is the idle state of a car, generating the sound pressure comparatively small in the state of an idling or false sound of a low frequency, and generating the sound to which sound pressure or a frequency was changed according to the vehicle speed, if it does in this way.

[0008]

[Example]

Hereafter, with reference to the drawing of attachment of the suitable example of this design, it explains in detail.

[0009]

Drawing 1 is drawing showing the whole circuit for generating the false engine sound of the electric vehicle (for example, electric two-flower vehicle) with which this design was applied. In drawing 1 , by emitting the pulse from which a frequency changes according to the rotational frequency of the motor M for actuation, the vehicle speed pulse signal emitted from the speed sensor 1 which can detect the vehicle speed branches in the control circuit 2 as a sounding-body actuation control means, one side inputs into F/V converter 3, and another side inputs into a frequency divider 4. In this example, this F/V converter 3 will output a transistor-on signal, if generating of a vehicle speed pulse signal is detected, and it turns on the transistor Q1 for relay actuation with that transistor-on signal.

[0010]

The above-mentioned frequency divider 4 can output the signal which is 0.5Hz, if a vehicle speed pulse signal occurs, and it can make the frequency of 0.5 Hz-Fmax (maximum frequency of arbitration) fluctuate according to the change in a vehicle speed pulse signal. The above-mentioned output signal of a frequency divider 4 is outputted to the normally open side of 2 location case index contact of the relay RL1 driven with said transistor Q1 for relay actuation. The oscillation signal from a frequency divider 4 and the oscillator circuit 5 for idle sounds established in juxtaposition (for example, 0.5Hz) is outputted to the normally closed side of 2 location case index contact of the relay RL1.

[0011]

The ON / off signal from the ignition switch IG as a preparation switch which makes the above-mentioned motor M controllable through the motor control circuit 6 input into the delay circuit 7 in this control circuit 2, and the output signal of the delay circuit 7 inputs into the reference clock oscillator circuit 8 and the 1st and 2nd oscillator circuits 9-10. The output signal of the reference clock oscillator circuit 8 is inputted into the oscillator circuit 5 for idle sounds, and the 1st and 2nd oscillator circuits 9-10. The 1st oscillator circuit 9 outputs a 2.0kHz (F1) signal, and the 2nd oscillator circuit 10 outputs a 1.6kHz (F2) signal. And the signal outputted through change-over contact of relay RY1 from a frequency divider 4 and the oscillator circuit 5 for idle sounds and each signal outputted from said 1st and 2nd oscillator circuits 9-10 input into the chime sound generation circuit 11.

[0012]

Moreover, both the loudspeakers 12 as the sounding body are connected so that it may pronounce, if the transistor Q2 by the side of a power source and the transistor Q3 of the earth side are turned on.

The above-mentioned transistor Q2 is turned on when the transistor Q4 turned on with the output signal of OR-circuit OR1 of the output stage of said chime sound generation circuit 11 turns on, and it turns on the transistor Q3 of each other [the output stage of the chime sound generation circuit 11] with the

output signal of parallel both AND circuit AD1 and AD2.
[0013]
CR time constant circuit which forms the wave-like signal dwindled after that [standup] is established in the input stage of above-mentioned OR-circuit OR1 for every timing of the standup and falling of the output signal of said frequency divider 4 or the oscillator circuit 5 for idle sounds. Therefore, the output of a transistor Q2 serves as a wave dwindled after starting continuously, as shown in drawing 2 .
[0014]
Moreover, the output signal of a frequency divider 4 or the oscillator circuit 5 for idle sounds will be inputted also into above-mentioned both AND circuit AD1 and AD2, and a 2.0kHz signal and a 1.6kHz signal will be outputted to a transistor Q3 to the timing of the above-mentioned standup and falling. Therefore, in the output of a transistor Q3, as shown in drawing 2 , a 2.0kHz signal and a 1.6kHz signal arise by turns.
[0015]
Thus, the signal pronunciation point of the constituted false engine sound generating circuit is shown below. First, if an ignition switch IG is turned ON like the engine start of an internal-combustion engine vehicle, while 0.5Hz signal from the oscillator circuit 5 for idle sounds will be outputted after 0.2s by minding a delay circuit 7, each frequency F1 and the signal of F2 are outputted from the 1st and 2nd oscillator circuits 9-10. In addition, in the idle state before start (it is equivalent to the idling condition of an internal-combustion engine vehicle), since the vehicle speed pulse signal is not generated from a speed sensor 1 and relay RL1 is in the condition of not exciting, 0.5Hz signal from the oscillator circuit 5 for idle sounds inputs into the chime sound generation circuit 11. Therefore, since the electronic chime sound from which a 2.0kHz signal and a 1.6kHz signal change as a false engine sound to the timing of this 0.5Hz signal (refer to drawing 2) is pronounced from a loudspeaker 12, an operator, a pedestrian, etc. can recognize that a car is an idle state.
[0016]
Next, if a throttle is operated, a car is started and a vehicle speed pulse arises, since a transistor Q1 will turn on and relay LR 1 will change, the signal of a frequency divider 4 comes to input into the chime sound generation circuit 11. And the frequency of the signal of a frequency divider 4 increases with lifting of the vehicle speed, and since the transistor Q2 and the period of Q3 become shorter than 0.5Hz as shown in drawing 2 , instead of [2.0kHz (F1) OFF / of a signal and a 1.6kHz (F2) signal] is rash according to the vehicle speed. Therefore, since the chime sound from which a 2.0kHz signal and a 1.6kHz signal change with the period which changes according to the vehicle speed occurs, an operator can operate, recognizing the chime sound which changes according to the vehicle speed. Moreover, the rate of the car with which a pedestrian etc. approaches can be distinguished to some extent with a sound.

[0017]
In addition, although it was made for a chime sound to change the frequency, it does not restrict to frequency change and you may make it change sound pressure in this example.
[0018]
Moreover, while connecting to an ignition switch IG the sounding bodies which are not limited to this example, for example, emit a comparatively small sound by the ON state of an ignition switch IG as a false engine sound generator concerning this design, such as a loudspeaker and a horn, you may make it the device which connects body of revolution with a motor or an axle, and strikes the sounding body with the revolution of body of revolution in order to generate the sound from which the vehicle speed is interlocked with and a period changes. Moreover, a program is created and you may make it control to change the period and sound pressure of a sound which the sounding body emits according to a vehicle speed input signal using a microcomputer etc.
[0019]
[Effect of the Device]
Thus, even if it can obtain change of the false sound which corresponds at the time of the idling of an internal-combustion engine vehicle, and the sound which is equivalent to the engine sound of an

internal-combustion engine vehicle by generating the false sound which changes according to the height of the vehicle speed in an electric vehicle and changes to an electric vehicle from an internal-combustion engine vehicle, while being able to operate according to this design, without producing inconvenience in any way, the condition of a car can be exactly told also to a pedestrian etc.

[Translation done.]

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TECHNICAL FIELD

[Industrial Application]
This design is related with the false engine sound generator for generating the false engine sound in an electric vehicle.
[0002]

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PRIOR ART

[Description of the Prior Art]
If it is in the electric vehicle which used the electric motor for power, there are few oscillations compared with the automobile using an internal combustion engine, and there is an advantage that an engine sound is also quiet. Moreover, if it is in such an electric vehicle, there are some which perform throttle actuation in the automobile using an internal combustion engine and same throttle actuation, and were made to perform operation based on an operator's volition.
[0003]
If it was in the electric vehicle as described above, since the motor (engine) sound was quiet, there was a problem that decision by the engine sound in the automobile of that the revolution of the motor at the time of transit is in what kind of condition about whether it is in the condition (ON state of an ignition switch) it can run, etc. and the conventional internal combustion engines could not be performed. Moreover, caution needed to be demanded from the pedestrian etc. and there were some which emitted the sound for telling that it is under transit in the conventional electric vehicle.
[0004]
As what emitted the above-mentioned sound, it is in the ON state of ignition, and the same condition, and the sound of a certain amount of sound pressure (frequency) level is generated, and there is a thing it was made to make it recognize that it is in the condition it can run. However, in the conventional electric vehicle, the sound of fixed sound pressure (frequency) is generated also in the time of a halt and transit, and there was a problem of being unnatural, to a run state including the height condition of a halt or the vehicle speed.
[0005]

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EFFECT OF THE INVENTION

[Effect of the Device]
Thus, even if it can obtain change of the false sound which corresponds at the time of the idling of an internal-combustion engine vehicle, and the sound which is equivalent to the engine sound of an internal-combustion engine vehicle by generating the false sound which changes according to the height of the vehicle speed in an electric vehicle and changes to an electric vehicle from an internal-combustion engine vehicle, while being able to operate according to this design, without producing inconvenience in any way, the condition of a car can be exactly told also to a pedestrian etc.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Device]
Taking an example by the trouble of such a conventional technique, the main objects of this design are to offer the false engine sound generator which may generate the suitable false engine sound according to the various operational status of an electric vehicle.
[0006]

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MEANS

[Means for Solving the Problem]
A preparation switch for such an object to make the motor for actuation of an electric vehicle pivotable according to this design, It is the false engine sound generator which has the vehicle speed detection means for detecting the vehicle speed, the sounding body, and a sounding-body actuation control means for generating a false engine sound from said sounding body. [when said sounding-body actuation control means detects the pivotable condition of said motor with said preparation switch] When said vehicle speed detection means detects the idle state of said electric vehicle, the sound of comparatively small sound pressure or a low frequency is generated from said sounding body. When said vehicle speed detection means detects the run state of said electric vehicle, it is attained by offering the false engine sound generator characterized by controlling to increase said sound pressure with lifting of the vehicle speed, or to raise said frequency.
[0007]

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OPERATION

[Function]
The sound which changes according to operational status as well as the engine sound of the conventional automobile can generate by being able to distinguish the condition are equivalent to the idling condition of the conventional internal-combustion engine vehicle, by detection that are in the pivotable condition of a motor and it is the idle state of a car, generating the sound pressure comparatively small in the state of an idling or false sound of a low frequency, and generating the sound to which sound pressure or a frequency was changed according to the vehicle speed, if it does in this way.
[0008]

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EXAMPLE

[Example]
Hereafter, with reference to the drawing of attachment of the suitable example of this design, it explains in detail.
[0009]
Drawing 1 is drawing showing the whole circuit for generating the false engine sound of the electric vehicle (for example, electric two-flower vehicle) with which this design was applied. In drawing 1 , by emitting the pulse from which a frequency changes according to the rotational frequency of the motor M for actuation, the vehicle speed pulse signal emitted from the speed sensor 1 which can detect the vehicle speed branches in the control circuit 2 as a sounding-body actuation control means, one side inputs into F/V converter 3, and another side inputs into a frequency divider 4. In this example, this F/V converter 3 will output a transistor-on signal, if generating of a vehicle speed pulse signal is detected, and it turns on the transistor Q1 for relay actuation with that transistor-on signal.
[0010]
The above-mentioned frequency divider 4 can output the signal which is 0.5Hz, if a vehicle speed pulse signal occurs, and it can make the frequency of 0.5 Hz-Fmax (maximum frequency of arbitration) fluctuate according to the change in a vehicle speed pulse signal. The above-mentioned output signal of a frequency divider 4 is outputted to the normally open side of 2 location case index contact of the relay RL1 driven with said transistor Q1 for relay actuation. The oscillation signal from a frequency divider 4 and the oscillator circuit 5 for idle sounds established in juxtaposition (for example, 0.5Hz) is outputted to the normally closed side of 2 location case index contact of the relay RL1.
[0011]
The ON / off signal from the ignition switch IG as a preparation switch which makes the above-mentioned motor M controllable through the motor control circuit 6 input into the delay circuit 7 in this control circuit 2, and the output signal of the delay circuit 7 inputs into the reference clock oscillator circuit 8 and the 1st and 2nd oscillator circuits 9-10. The output signal of the reference clock oscillator circuit 8 is inputted into the oscillator circuit 5 for idle sounds, and the 1st and 2nd oscillator circuits 9-10. The 1st oscillator circuit 9 outputs a 2.0kHz (F1) signal, and the 2nd oscillator circuit 10 outputs a 1.6kHz (F2) signal. And the signal outputted through change-over contact of relay RY1 from a frequency divider 4 and the oscillator circuit 5 for idle sounds and each signal outputted from said 1st and 2nd oscillator circuits 9-10 input into the chime sound generation circuit 11.
[0012]
Moreover, both the loudspeakers 12 as the sounding body are connected so that it may pronounce, if the transistor Q2 by the side of a power source and the transistor Q3 of the earth side are turned on.
The above-mentioned transistor Q2 is turned on when the transistor Q4 turned on with the output signal of OR-circuit OR1 of the output stage of said chime sound generation circuit 11 turns on, and it turns on the transistor Q3 of each other [the output stage of the chime sound generation circuit 11] with the output signal of parallel both AND circuit AD1 and AD2.
[0013]

CR time constant circuit which forms the wave-like signal dwindled after that [standup] is established in the input stage of above-mentioned OR-circuit OR1 for every timing of the standup and falling of the output signal of said frequency divider 4 or the oscillator circuit 5 for idle sounds. Therefore, the output of a transistor Q2 serves as a wave dwindled after starting continuously, as shown in drawing 2 .

[0014]

Moreover, the output signal of a frequency divider 4 or the oscillator circuit 5 for idle sounds will be inputted also into above-mentioned both AND circuit AD1 and AD2, and a 2.0kHz signal and a 1.6kHz signal will be outputted to a transistor Q3 to the timing of the above-mentioned standup and falling. Therefore, in the output of a transistor Q3, as shown in drawing 2 , a 2.0kHz signal and a 1.6kHz signal arise by turns.

[0015]

Thus, the signal pronunciation point of the constituted false engine sound generating circuit is shown below. First, if an ignition switch IG is turned ON like the engine start of an internal-combustion engine vehicle, while 0.5Hz signal from the oscillator circuit 5 for idle sounds will be outputted after 0.2s by minding a delay circuit 7, each frequency F1 and the signal of F2 are outputted from the 1st and 2nd oscillator circuits 9-10. In addition, in the idle state before start (it is equivalent to the idling condition of an internal-combustion engine vehicle), since the vehicle speed pulse signal is not generated from a speed sensor 1 and relay RL1 is in the condition of not exciting, 0.5Hz signal from the oscillator circuit 5 for idle sounds inputs into the chime sound generation circuit 11. Therefore, since the electronic chime sound from which a 2.0kHz signal and a 1.6kHz signal change as a false engine sound to the timing of this 0.5Hz signal (refer to drawing 2) is pronounced from a loudspeaker 12, an operator, a pedestrian, etc. can recognize that a car is an idle state.

[0016]

Next, if a throttle is operated, a car is started and a vehicle speed pulse arises, since a transistor Q1 will turn on and relay LR 1 will change, the signal of a frequency divider 4 comes to input into the chime sound generation circuit 11. And the frequency of the signal of a frequency divider 4 increases with lifting of the vehicle speed, and since the transistor Q2 and the period of Q3 become shorter than 0.5Hz as shown in drawing 2 , instead of [2.0kHz (F1) OFF / of a signal and a 1.6kHz (F2) signal] is rash according to the vehicle speed. Therefore, since the chime sound from which a 2.0kHz signal and a 1.6kHz signal change with the period which changes according to the vehicle speed occurs, an operator can operate, recognizing the chime sound which changes according to the vehicle speed. Moreover, the rate of the car with which a pedestrian etc. approaches can be distinguished to some extent with a sound.

[0017]

In addition, although it was made for a chime sound to change the frequency, it does not restrict to frequency change and you may make it change sound pressure in this example.

[0018]

Moreover, while connecting to an ignition switch IG the sounding bodies which are not limited to this example, for example, emit a comparatively small sound by the ON state of an ignition switch IG as a false engine sound generator concerning this design, such as a loudspeaker and a horn, you may make it the device which connects body of revolution with a motor or an axle, and strikes the sounding body with the revolution of body of revolution in order to generate the sound from which the vehicle speed is interlocked with and a period changes. Moreover, a program is created and you may make it control to change the period and sound pressure of a sound which the sounding body emits according to a vehicle speed input signal using a microcomputer etc.

[0019]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] Drawing showing the whole false engine sound generating circuit of the electric vehicle with which this design was applied.
[Drawing 2] The timing diagram which shows the generating point of a false engine sound.
[Description of Notations]
1 Speed Sensor
2 Control Circuit
3 F/V Converter
4 Frequency Divider
5 Oscillator Circuit for Idle Sounds
6 Motor Control Circuit
7 Delay Circuit
8 Reference Clock Oscillator Circuit
9 1st Oscillator Circuit
10 2nd Oscillator Circuit
11 Chime Sound Generation Circuit
12 Loudspeaker

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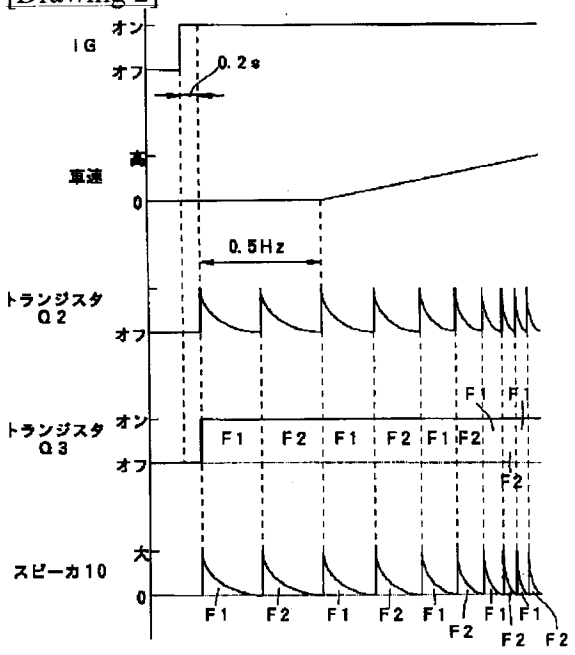
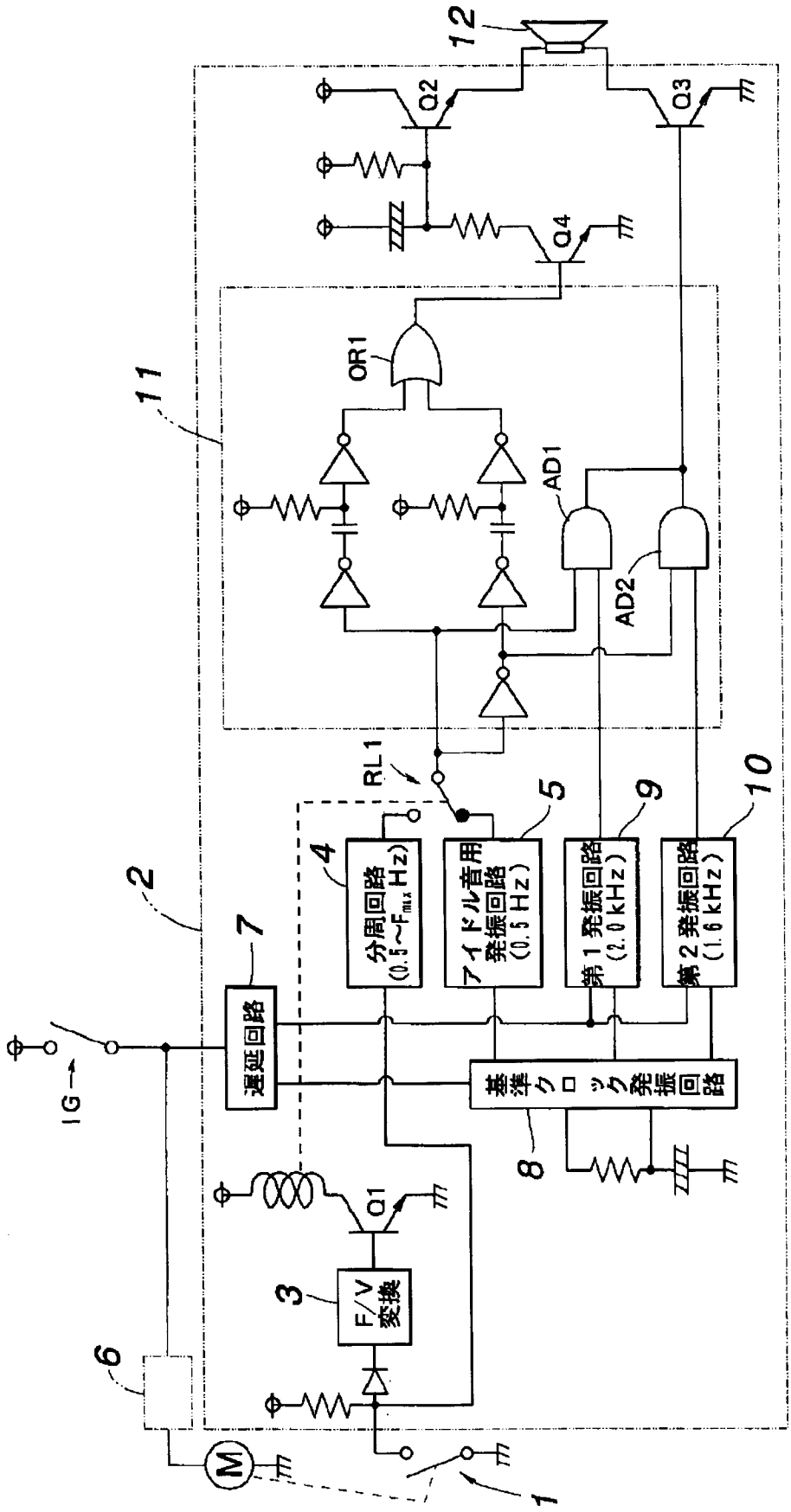
DRAWINGS

[Drawing 2]



[Drawing 1]


12
Q2
Q3
Q4
OR1
11
AD1
AD2
RL1
5
9
10
4
2
7
分周回路
(0.5~Fmax Hz)
アイドル音用
発振回路
(0.5 Hz)
第1発振回路
(2.0 kHz)
第2発振回路
(1.6 kHz)
遅延回路
IG
基準クロック発振回路
8
Q1
3
F/V
変換
6
M
1